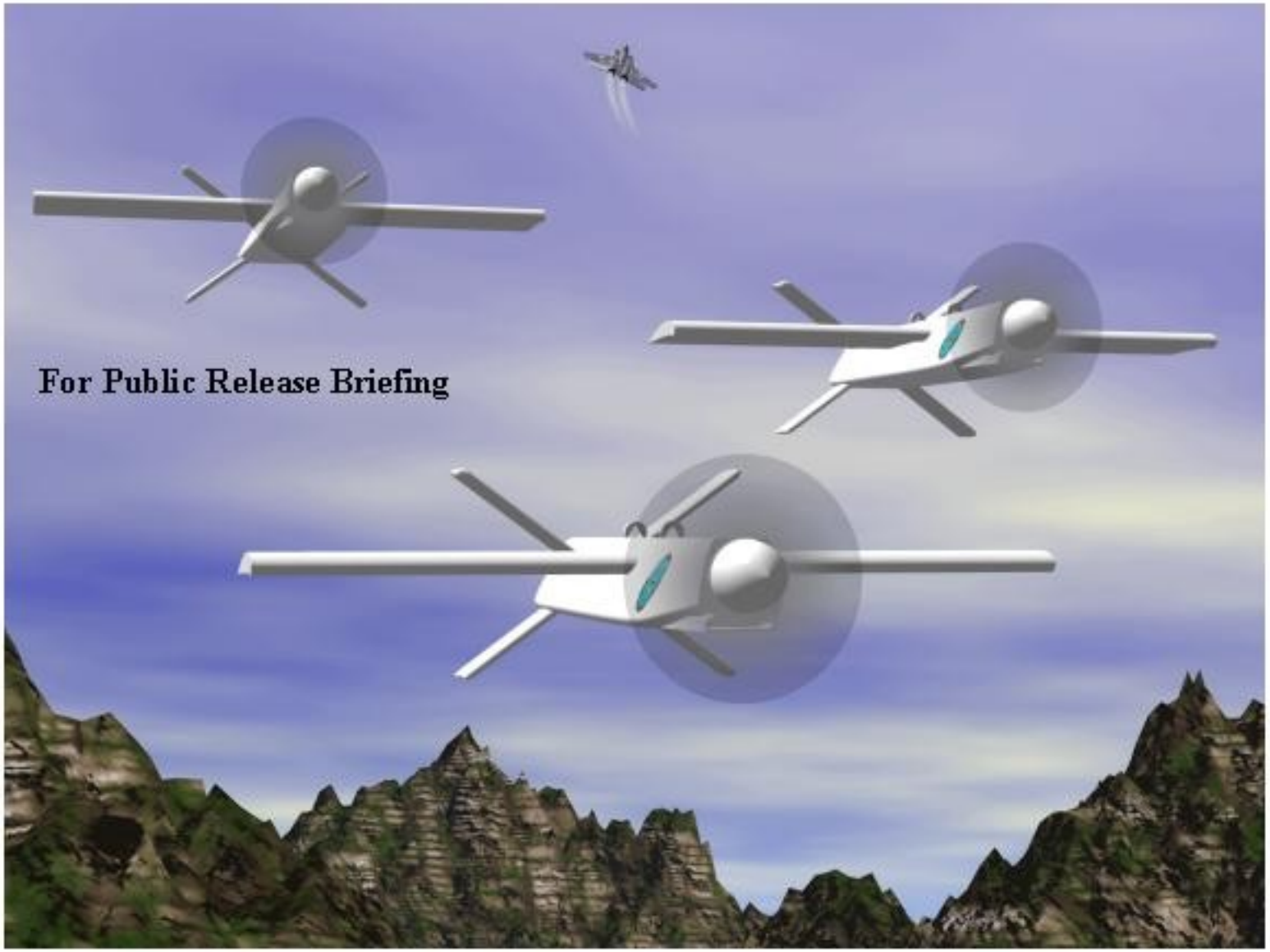
Loitering EW Killer ACTD



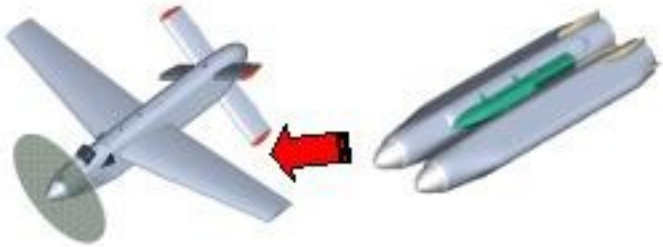
LEWK ACTD Objectives

ACTD Focus: SEAD

- LEWK deployed by UH-60 Black Hawk (initial platform)
- Vehicles fly preprogrammed radar jamming and attack profiles
  - Payload includes radar jammer and munitions
- Vehicles hand over to aircraft, ship or ground for management
  - Data Links used for real time re-tasking, imagery receipt
- LEWK flies 8 hrs at 80-150 knots up to 15,000
- Man-in-loop look-bomb-BDA attacks
  - Via on-board EO and IR sensors
  - Loitering response at line-of-sight and beyond
  - 'Sensor is the shooter'
- Vehicles recovered via parachute
- Main objective: Affordable, modular, multi-purpose capability

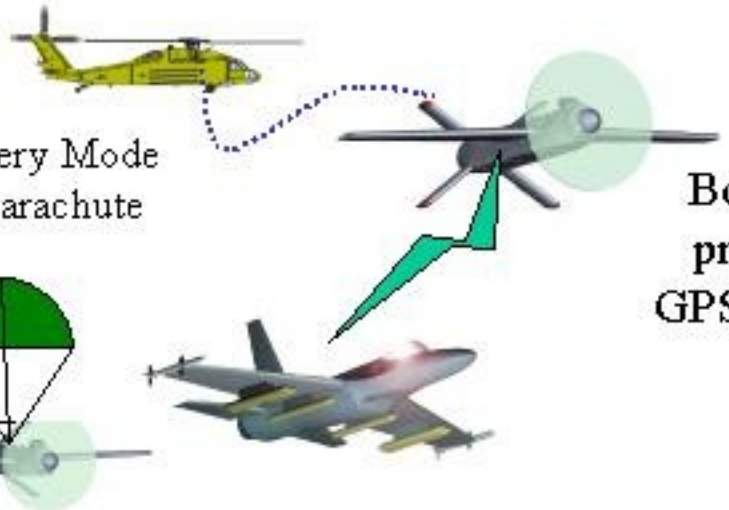
LEWK Concept

Transforms after deployment

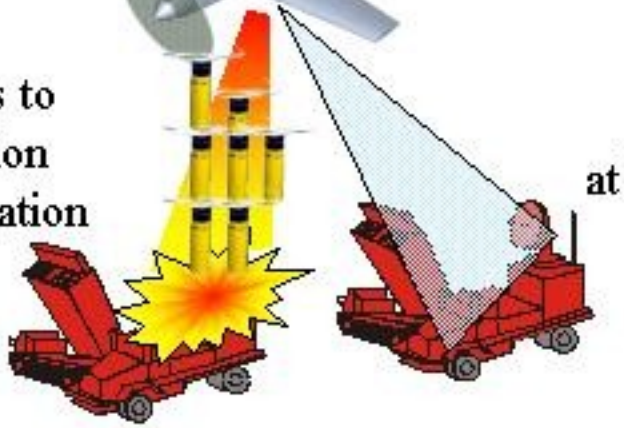


- Low Cost - Expendable or recoverable UAV "truck"
- Transforms from 'slick' form into low speed aircraft
  - 8 hours - 80 to 150 knots - 800-1000 nmi - 200 lb Payload
- Radar Jamming Capability
- TV cameras/weapons on Low/Slow platform
  - ✓Enables man-in-loop fast look-bomb-BDA ("Sensor is Shooter")
  - ✓Loitering fire support: Able to go Low/Slow
  - ✓CONOPS developed by European Command
- Preprogrammed plus in-flight retasking
- ACTD Launch Mode
  - Airborne drop from UH-60 Black Hawk
- Recovery Mode
  - Via parachute

Retaskable by EA-6B, F-16, Rivet Joint, EUT, etc.



Bombs to precision GPS location



Radar jamming at short range

LEWK Technical Approach

6.3 technologies from Joint Navy/Army FASM-Quicklook program
Inflatable wings, heavy fuel engine, G hard compact design for tube launch

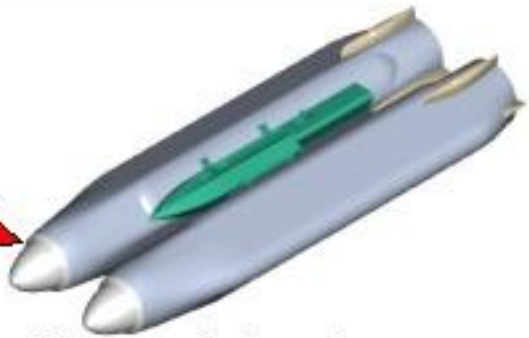
SAIC IRAD
Software and image processing

COTS technologies
CCD EO and IR cameras
Actuators, avionics

Demonstrated, affordable military technologies
Jam resistant GPS, com links, radar jammer, submunitions

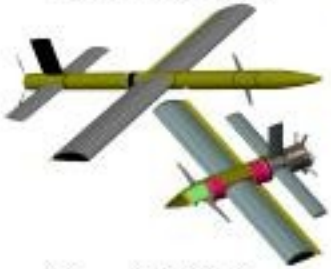
Open architecture plug in modular payloads - 4 stations in payload bay

Low Speed Cruise/Loiter Essential to Man-in-loop targeting, BDA, other interfaces



Compact Carriage

Inflate Wing/Tail



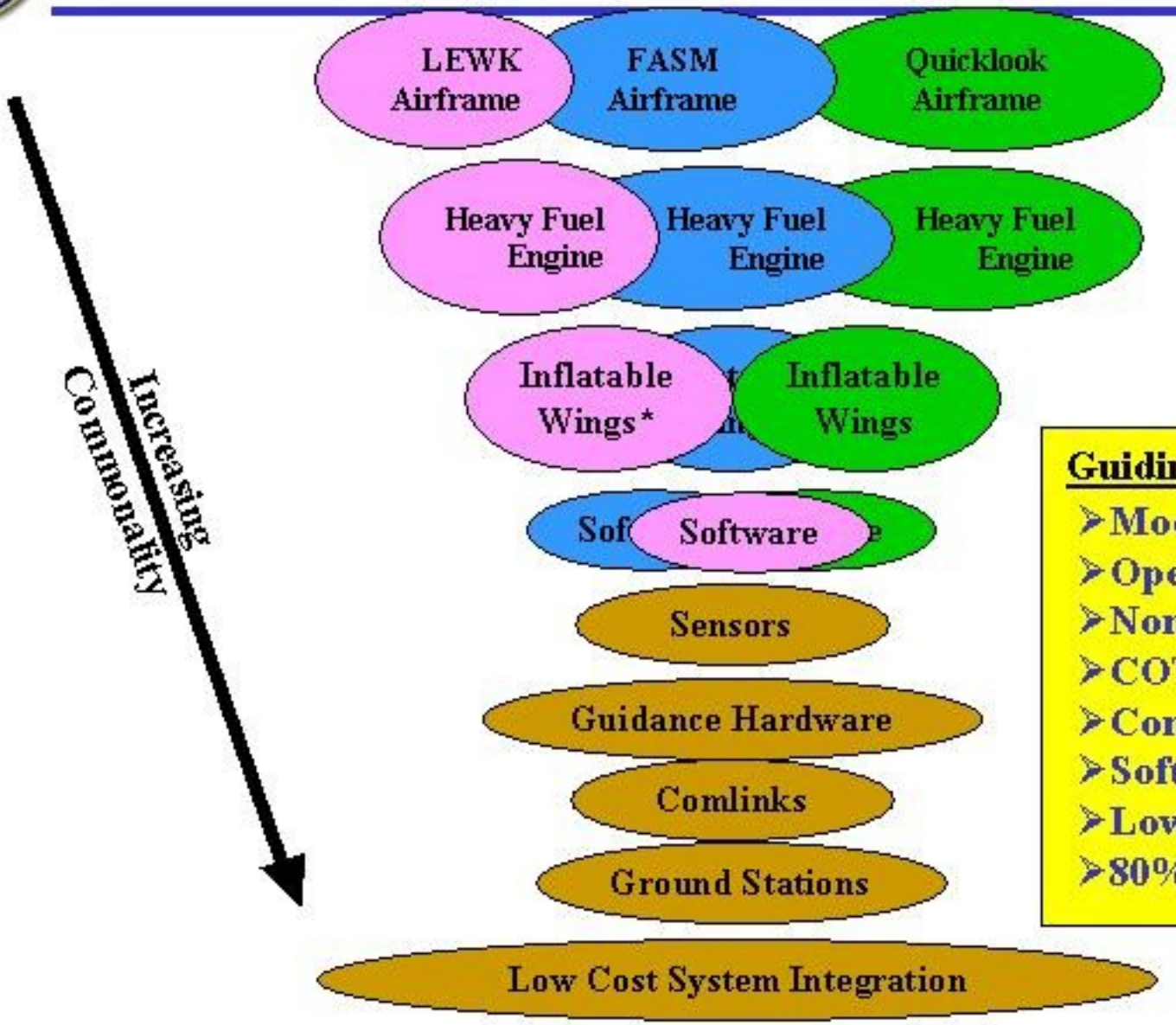
Navy FASM
Army Quicklook

High stiffness
Inflatable airfoils

Shorter Slant Ranges of 500-5000 ft Enable:

Low Cost Camera System
Visible, Near IR, LWIR
All Weather Fog/Smoke Penetration

LEWK-FASM-Quicklook Program Cooperation



Guiding Principles

- Modularity
- Open Architecture
- Non-Proprietary
- COTS/GOTS
- Component Reuse
- Software Reuse
- Low Cost
- 80% Solutions

LEWK Spiral Development Platforms

LEWK Alpha

COTS Platform
Low Cost GNC Pathfinder Testbed

LEWK Bravo

33% Scale LEWK; 100% Scale FASM
Legacy Aero Pathfinder

LEWK Charlie

50% Scale LEWK
Concept Demonstration Pathfinder

LEWK Foxtrot

100% Scale LEWK
Developmental Testbed

LEWK Juliet

Full Scale Testbed
Developmental Test Bed

LEWK Kilo

100% Scale LEWK
Operational Test/Demos

LEWK Full Scale Vehicles

FOXTROT – Aerodynamics and Controls (For Baseline)

- Fixed External Shape (baseline for wind tunnel and controls)
- Arbitrary Internal Structure (optimize for cheap, quick, reliable delivery)
- Arbitrary Protuberances

JULIET – Engineering Test Bed (For Experimentation)

- Modular Airframe (swap engines, wings, tails, payloads, recovery…)
- Representative Internal Structure (optimize for engineering flexibility)
- Supports Major Transformations (wings, tail, propellers)
- Fixed Minor Articulations (ports, apertures, antennas, covers, etc.)
- Optimized for flexibility in testing, prior to dense packaging investments
- Provide additional space for engineering test instrumentation
- Pathfinder for fit checks and enhanced capability options

KILO – Objective Demonstrator (For Assessment)

- Full objective functionality (all transformations & articulations)
- Optimized for full Military Utility Assessment
- Still not optimized for manufacturing efficiency

LEWK Juliet Airframe

LEWK - Juliet

Design Considerations:

- 'Sky-Truck' Design
- Modular
- Heavy-Fuel Engine
- Sacrificial Skin
- Dispensable Payloads positioned near CG
- Removable Landing Gear
- Swappable Engine/Tail
- Volume to carry non-optimized payloads and test equipment
- Deployable from Aircraft (ACTD- Helicopter Deploy)

Juliet Airframe Relative Size

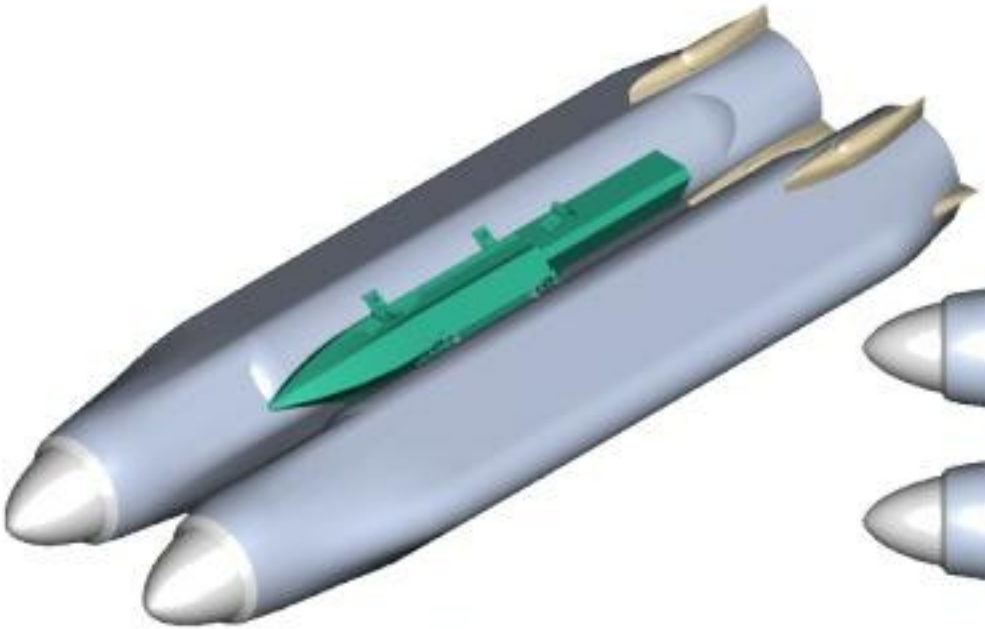
LEWK - Juliet

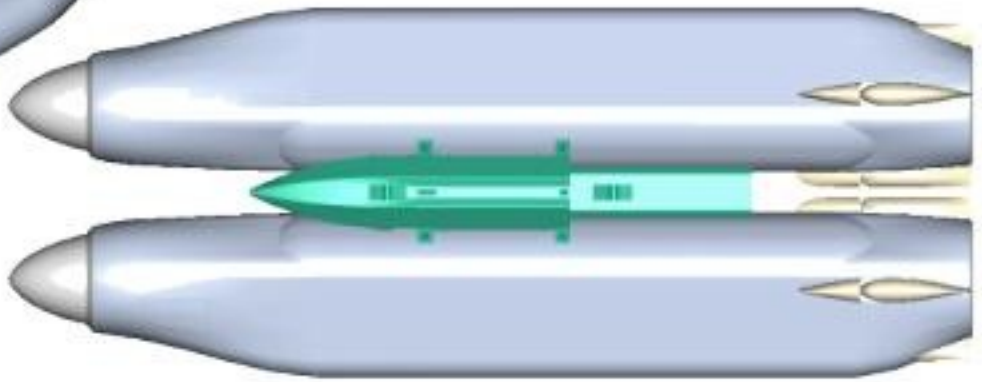
'Test Bed' Considerations:

- Modified Turboprop Tractor (Lengthened Nose)
- Reconfigurable Payloads
- Reconfigurable Landing Gear
- Reconfigurable Wing Placement
- Tail Dragger Gear Config.

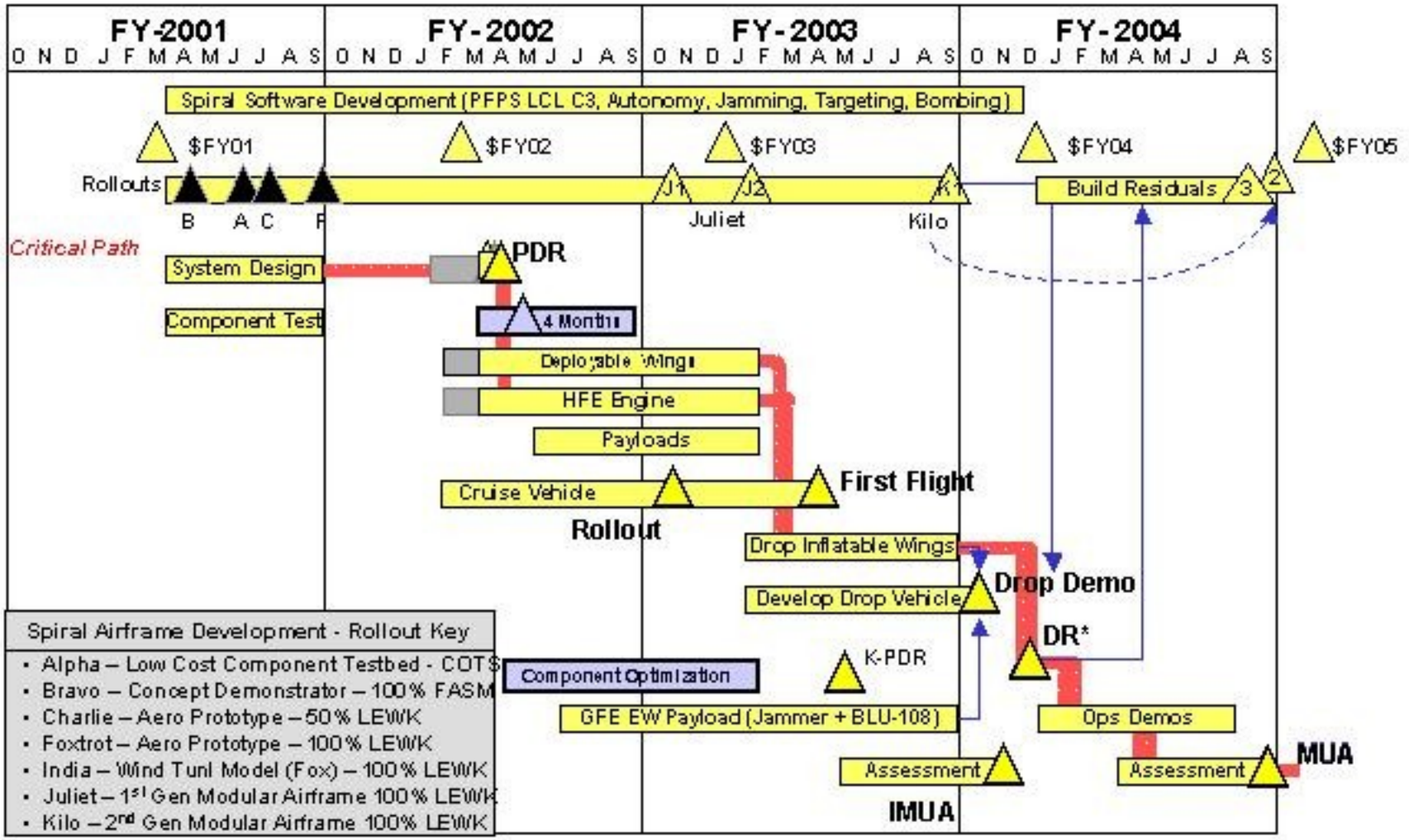
PROPRIETARY DATA

LEWK Carriage on Bomb Rack



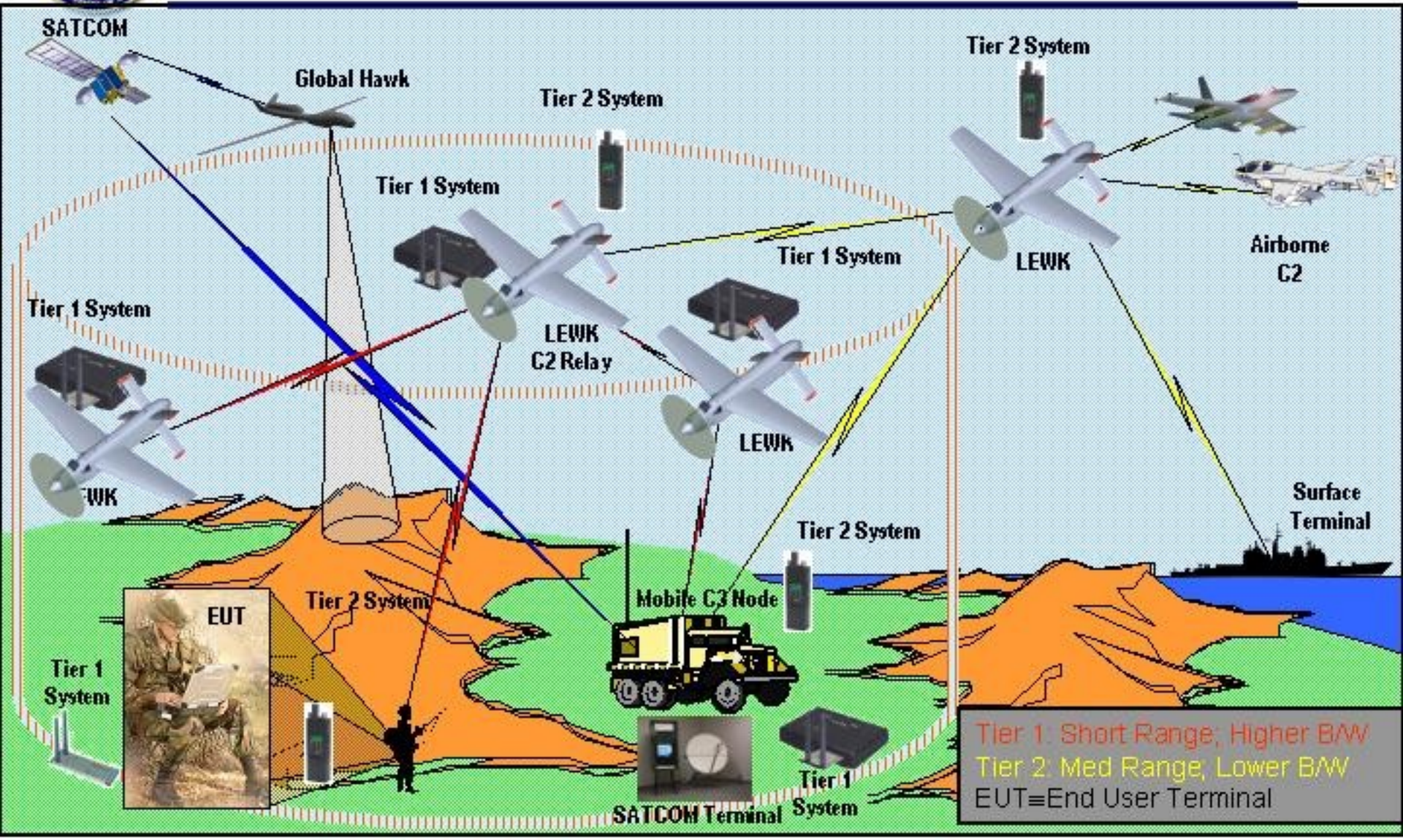


LEWK ACTD Schedule



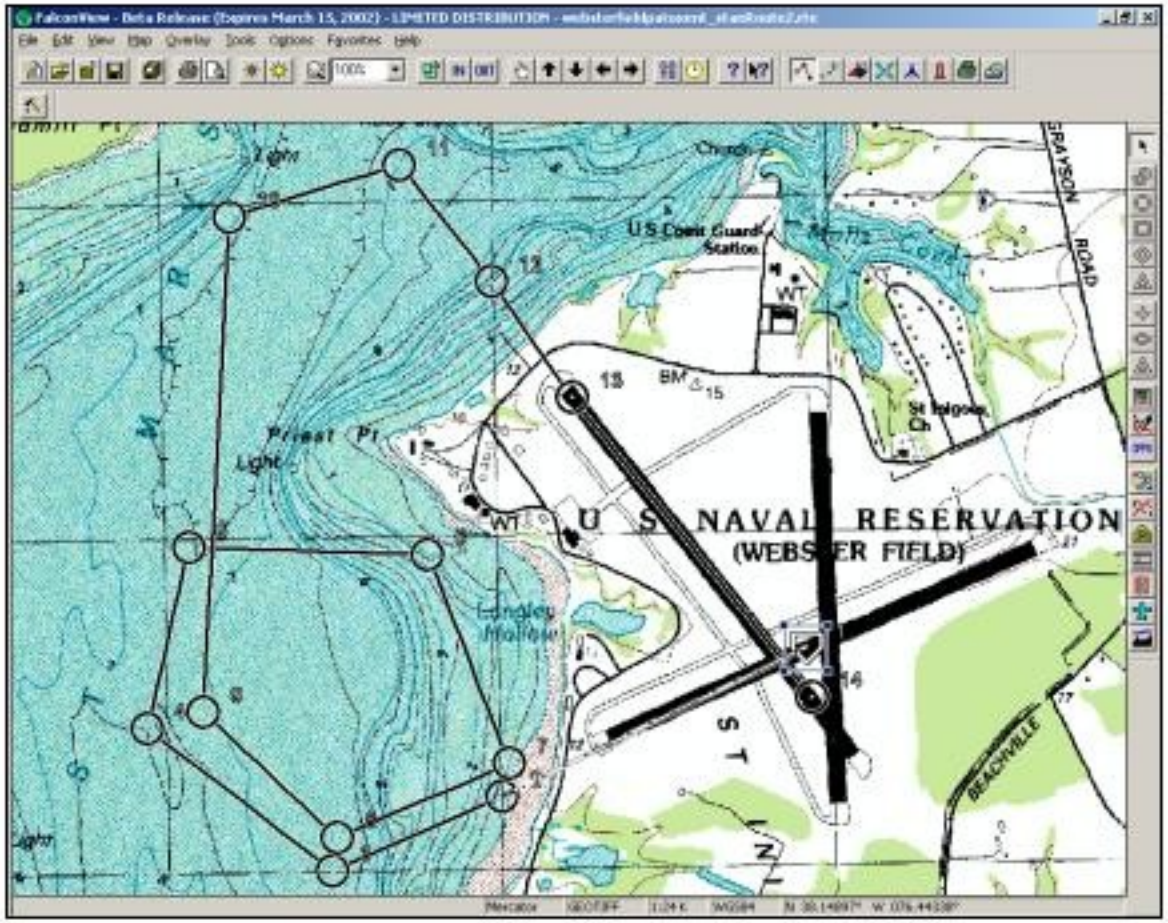
*DR = Design Review at final iteration of spiral development process.

LEWK ACTD Command & Control



LEWK Control 'Station'

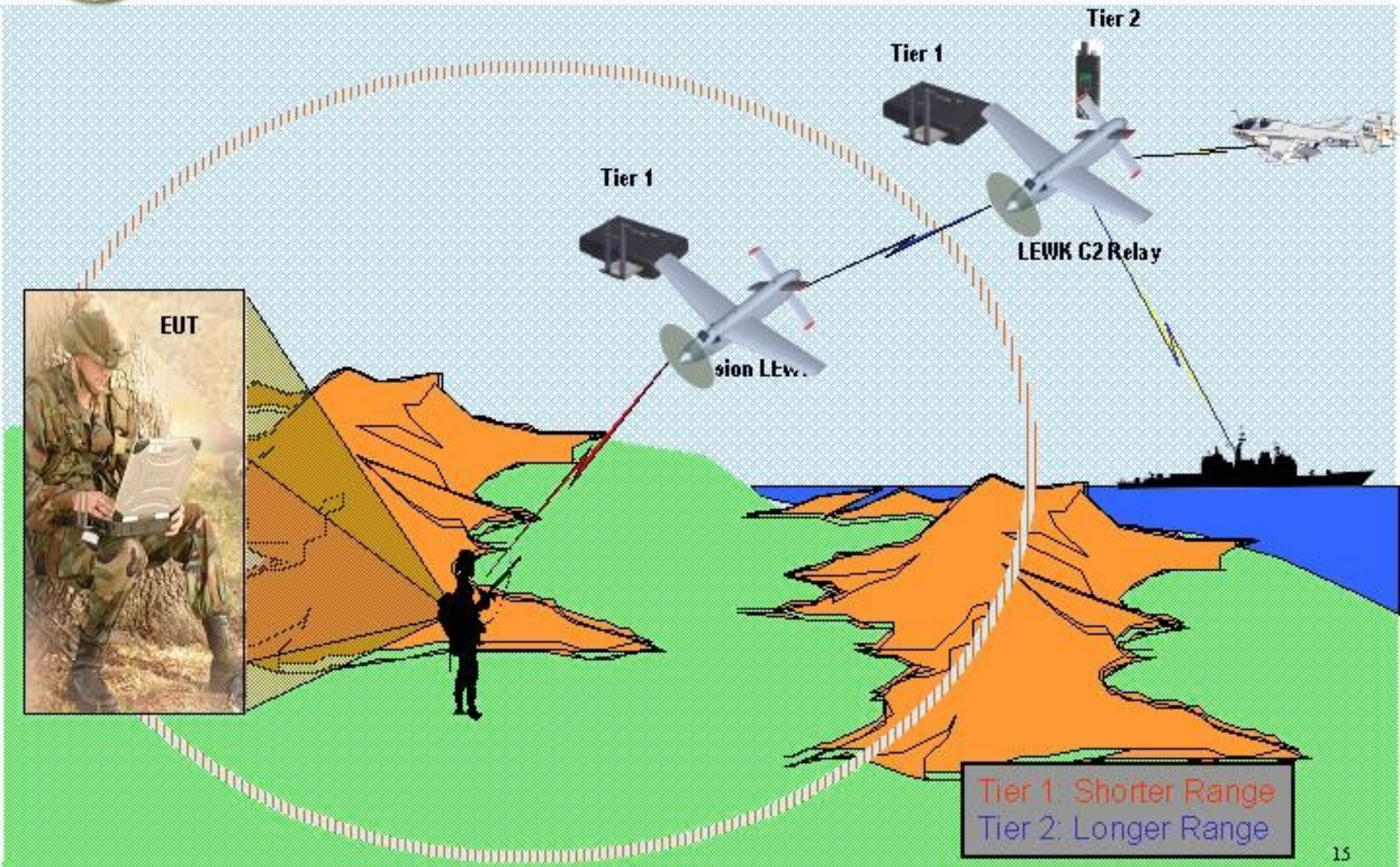
Laptop Computer Based; Existing System



...enhanced with:

Dynamic Supervision
and
"Smart Waypoints"

LEWK Control Footprint



LEWK ACTD Testing Status

- Initial 'Juliet' Wind Tunnel Testing Complete
  - Oct 02; NASA Langley facility; very successful
  - Included deployed wings, tail section
- First flight: LEWK 'Bravo' 26 Apr 01
- First Flight: LEWK 'Charlie' 9 Aug 01
- Overall: 70 flights successfully accomplished to date (LEWK, FASM, QuickLook, Mike, November)
- First Juliet taxi; 18/19 Mar '03
  - Slow speed taxi at Stafford (VA) Regional Airport; total success
- First Juliet flight; Apr '03
  - Wings pre-deployed; heavy fuel engine
  - Will be an autonomous flight
  - Western U.S. dry lake bed

LEWK Deployable Wing Testing

Aug 02

Full Scale Wing Test

- Very successful
- Test speeds 40-120 Kts
- Designed for 4 G limit

LEWK Juliet Wing 'Fit Check' Testing

10 Oct 02

LEWK Juliet Initial Wind Tunnel Testing

17 Oct 02

Initial results: Very successful
Wings, tails performed as expected
Good aerodynamic performance

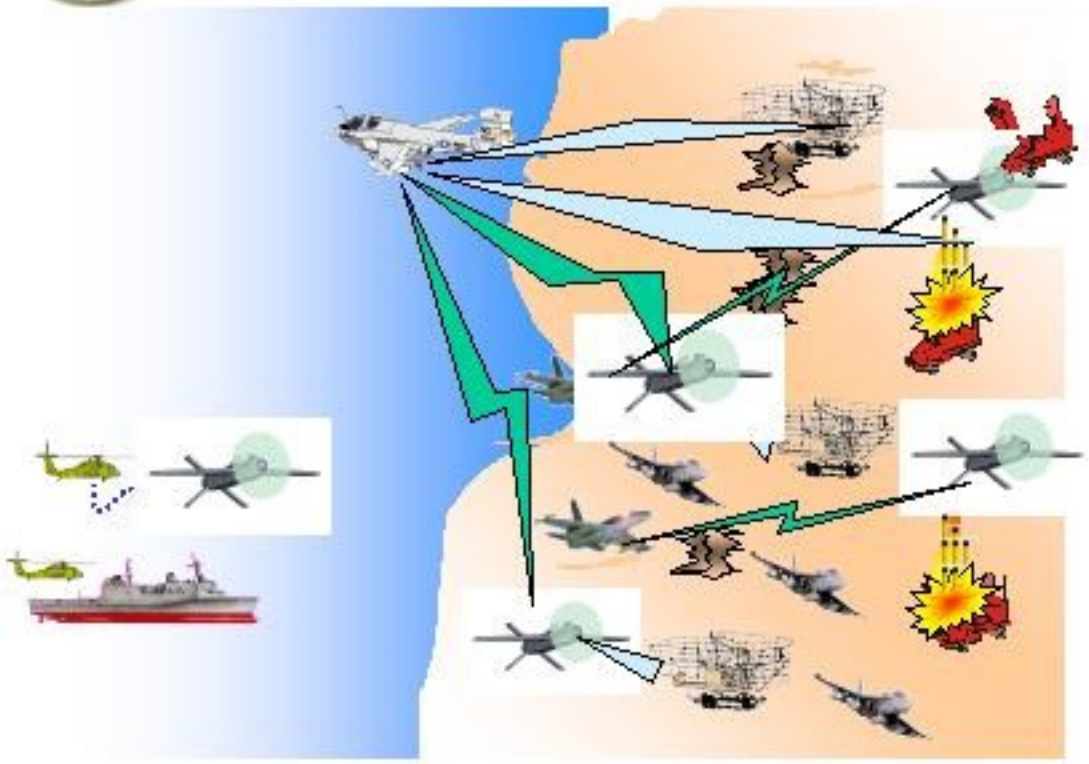
LEWK Juliet Initial Taxi Testing

19 Mar 02; Stafford VA Regional Airport

LEWK Mission Need, Requirements

- FY01 ACTD prioritization list (via JROCM) released by VC/JCS (General Richard Myers) 5 Dec 00
  - LEWK listed as #5 of 15 new starts
  - Joint Staff Briefings (through JROC) Nov 00
- CJCSI 3170.01B, Enclosure E States:
  - ACTD listed on JROCM (as above) is equivalent to statement of mission need
  - I.E. LEWK has Mission Need Statement
- LEWK ACTD Functional Requirements Document
  - Used by European Command to establish ACTD functional objectives
  - Approved by EUCOM/J3

LEWK: Conclusion



- Initial Mission: EW / SEAD
- Battle Damage Assessment asset
- Force Multiplier for EA-6B
- Overhead Com Relay functionality
- Data Link permits re-tasking
- Air launched by helos (baseline) and fixed wing (add'l funding req'd)
- Low cost; Recoverable via parachute
- Medium Endurance / Range Vehicle

LEWK ACTD Management:

Technical Management: Joint Precision Strike Demonstration Project Office

Transition Management: Aeronautical Systems Center

Operations Management: HQ European Command

SAIC Program Management: Science Applications International Corporation

Lead Service Sponsor: Air Combat Command